CLAIMS

1. Continuously variable hydromechanical transmission for agricultural tractors, comprising:

- an input shaft (IS) arranged to be coupled to a prime mover of the tractor and extending along a first direction (x1) substantially aligned with the shaft of the prime mover and with a shaft (S1) of the power take-off of the tractor;
- an output shaft (OS);
- a hydrostatic unit (HU) including a variable displacement pump (P) arranged to be driven by the prime mover shaft of the tractor and a motor (M) driven by the pump (P), wherein the pump and motor are positioned substantially in line along a second direction (x2) spaced transversely downwards from the said first direction (x1);
- a torque splitter unit (TSU) of the epicyclic type, positioned substantially in line with the hydrostatic unit (HU) along the said second direction (x2) and including a first and a second input shaft (S3, S4), coupled to the motor (M) of the hydrostatic unit (HU) and to the prime mover of the tractor respectively, and at least a first and a second output shaft (S5, S6), the rotational speeds of the said first and second output shafts (S5, S6) varying, respectively, in a first and a second range (VD1-VD2, VC1-VC2; VD1-VD2, VB1-VB2) adjacent to each other, at high speed and low speed respectively, as the rotational speed of the first input shaft (S3) varies between a maximum value (rpmA; rpmC) and a minimum value (-rpmA; -rpmC);
- a clutch unit (CU), positioned substantially in line with

the hydrostatic unit (HU) and with the torque splitter unit (TSU) along the said second direction (x2) and arranged to couple the output shaft (OS) of the transmission selectively to the first or second output shaft (S5, S6) of the torque splitter unit (TSU), in such a way as to provide a pair of forward operating ranges ("transport" and "work"), at high and low speed respectively; and

- a reversing unit (RU), positioned substantially in line with the hydrostatic unit (HU), the torque splitter unit (TSU) and the clutch unit (CU) along the said second direction (x2), and interposed between the clutch unit (CU) and the output shaft (OS) of the transmission, the said unit being arranged to provide a reverse operating range ("reverse").

2. Hydromechanical transmission according to Claim 1, characterized in that it also comprises a first clutch (Ci) for coupling the input shaft (IS) of the transmission to the shaft of the prime mover of the tractor.

3. Hydromechanical transmission according to Claim 1 or 2, characterized in that the input shaft (IS) is made in the form of a hollow shaft and houses within it the shaft (S1) of the power take-off of the tractor.

4. Hydromechanical transmission according to any one of the preceding claims, characterized in that the input shaft (IS) carries a first and a second driving gear wheel (G1, G3) meshing, respectively, with a third driven gear wheel (G2), coupled to a driving shaft (S2) of the pump (P) of the hydrostatic unit (HU), and with a fourth driven gear wheel

(G4), coupled to the second input shaft (S4) of the torque splitter unit (TSU), in such a way that the pump (P) and the shaft (S4) are driven by the input shaft (IS), in other words by the prime mover of the tractor, with corresponding constant predetermined transmission ratios (τ_{12}, τ_{34}) through the gearings (G1-G2) and (G3-G4), respectively.

5. Hydromechanical transmission according to any one of the preceding claims, characterized in that the torque splitter unit (TSU) includes:

- a first input sun gear (A) drivingly connected to the first input shaft (S3);
- a second input sun gear (B) drivingly connected to the second input shaft (S4);
- an output sun gear (D) drivingly connected to the first output shaft (S5); and
- a double planet carrier (C) which carries, on an inner circumference, sets of three planet gears (sa, sb, sd) drivingly connected for rotation to each other, namely a first planet gear (sa), a second planet gear (sb) and a third planet gear (sd), and, on an outer circumference, fourth planet gears (se); each first planet gear (sa) meshing with the first input sun gear (A) via a corresponding fourth planet gear (se), each second planet gear (sb) meshing with the second input sun gear (B) and each third planet gear (sd) meshing with the output sun gear (D); the planet carrier (C) also being drivingly connected to the second output shaft (S6).

6. Hydromechanical transmission according to any one of Claims 1 to 4, characterized in that the torque splitter unit

(TSU) includes:

- a first input sun gear (A) drivingly connected to the first input shaft (S3);
- an input planet carrier (C) drivingly connected to the second input shaft (S4);
- an output sun gear (D) drivingly connected to the first output shaft (S5);
- an output ring gear (B) drivingly connected to the second output shaft (S6),

wherein the planet carrier (C) carries:

- sets of two planet gears (sb, sd), drivingly connected for rotation to each other, namely a first planet gear (sb) and a second planet gear (sd), and third planet gears (sa), each first planet gear (sb) meshing with the input sun gear (A) via a corresponding third planet gear (sa) and each second planet gear (sd) being interposed between the output sun gear (D) and the output ring gear (B).

7. Hydromechanical transmission according to any one of the preceding claims, characterized in that the reversing unit (RU) includes:

- a first and a second input shaft (S7, S8);
- a first sun gear (Ar) drivingly connected to the said first input shaft (S7);
- a second sun gear (Br) drivingly connected both to the said second input shaft (S8) and to the output shaft (OS) of the transmission; and
- a double planet carrier (Cr), which carries on an inner circumference sets of two planet gears (sar, sbr), drivingly connected for rotation to each other, namely a first planet

gear (sar) and a second planet gear (sbr), and, on an outer circumference, third planet gears (sdr), each first planet gear (sar) meshing with the first sun gear (Ar), and each second planet gear (sbr) meshing with the second sun gear (Br) via a corresponding third planet gear (sdr), the gear carrier (Cr) being mounted rotatably with respect to the said input and output shafts (S6, S7, OS) and being lockable via a braking device (BD).

8. Hydromechanical transmission according to any one of the preceding claims, characterized in that the clutch unit (CU) includes:

- a first clutch (Cw) for coupling the first and second input shaft (S7, S8) of the reversing unit (RU) to provide the said low-speed forward operating range ("work") of the transmission; and
- a second clutch (Ct) for coupling the first output shaft (S5) of the torque splitter unit (TSU) to the second input shaft (S8) of the reversing unit (RU) to provide the said high-speed forward operating range ("transport") of the transmission.

9. Hydromechanical transmission according to any one of the preceding claims, characterized in that it also comprises an electronic controller for setting the rotational speed of the pump (P) of the hydrostatic unit (HU), for engaging or disengaging the clutches (Ci, Ct, Cw) and for activating or disabling the braking device (BD) of the reversing unit (RU) according to predetermined operating modes, to provide the aforesaid forward operating ranges ("work" and "transport") and the reverse operating range ("reverse").

10. Hydromechanical transmission according to Claim 9, characterized in that it also comprises a first speed sensor (ss1) for detecting the rotational speed of the output shaft (S3) of the hydrostatic unit (HU), in other words that of the first input shaft of the torque splitter unit (TSU), a second speed sensor (ss2) for detecting the rotational speed of the input shaft (IS) of the transmission and a third speed sensor (ss3) for detecting the rotational speed of the output shaft (OS) of the transmission, each of the said sensors supplying a corresponding signal to the electronic controller of the transmission.

11. Hydromechanical transmission according to any one of the preceding claims, characterized in that the hydrostatic unit (HU) can supply a rotational speed of the first input shaft (S3) of the torque splitter unit (TSU), the modulus of which is greater than the modulus of the minimum value (-rpmA; -rpmC), in such a way that when the transmission is operating in the low-speed operating range ("work") it is possible to reverse at low speed without the need to operate the reversing unit (RU) and the clutch unit (CU).